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AUTHOR Todd, Ronald D.
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ABSTRACT

A cooperative Automation Study Project is proposed between The Institute for the Study of Technology in Education (TIE) and the Material Handling Institute (MHI). The project would develop instructional materials to support study about automation, integrate a support equipment system with the materials, and utilize a portion of the resources of industry and the talents of interested individuals in the development of instructional materials reflective of contemporary technology. There are four aspects of the project under consideration: (1) the curriculum program, (2) the organization of TIE, (3) the missions of TIE, and (4) the outputs of the project. Technology is defined here as the integrator and director of knowledge as applied to solving practical problems. On the ninth grade level, the six parts of technology are materials, processes, machines, energy, information, and man. On the next level, the student studies in the areas of communications, construction, manufacturing, or service. At Grade 12 level, work will be concentrated in research and development and job staging. (Author/GEB)

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AUTOMATION IN THE SCHOOLS

A PRESENTATION ON THE AUTOMATION STUDY PROJECT

GIVEN TO THE MATERIAL HANDLING INSTITUTE,

PHILADELPHIA, PENNSYLVANIA

Dr. Ronald D. Todd

Director

The Institute for the Study of Technology in Education
Case Western Reserve University
Department of Education
Cleveland, Ohio 44106

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The purpose of this presentation is to describe a proposed cooperative effort between TIE Institute (The Institute for the Study of Technology in Education) and the MHI. This cooperative effort will be referred to as the Automation Study Project.

The purposes of the Automation Study Project are:

- to develop instructional materials to support student and teacher study about and involvement in instances of automation
- to integrate a support equipment system currently under development by the TIE staff with these instructional materials
- to utilize a portion of the resources of industry and the talents of interested individuals in the development of instructional materials reflective of contemporary technology

Four major aspects related to the Automation Study Project should be considered in order to provide an overview of the project and the context within which it fits. The four aspects are: (1) the curriculum program, (2) the organization of TIE, (3) the missions of TIE, and (4) the outputs of the Automation Study Project. A description of each of these follows:

Program

Consider, if you will, your own junior high experience in shop whether it was called industrial arts, manual arts, manual training

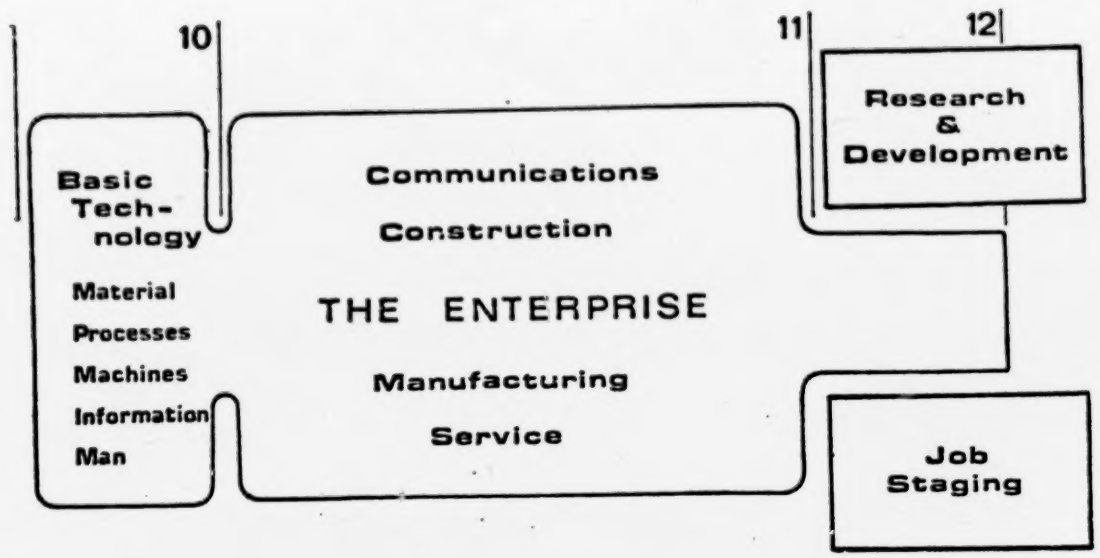
or some other name. Try to build that scene in your imagination. Now think of what you are involved in and see in your work in industry and technology. Compare these two imaginary scenes and mark the contrast. The gap that exists between these two sets of experiences for you is just as great for today's students. These students, however, are no longer afforded the chance to grow into the business so to speak; they are catapulted into it. The difficulty faced by the student in building a bridge between what he knows and has experienced to this unknown world of work and technology may well be increased by the school curriculum or program.

We in TIE see the curriculum of public school children as consisting of four major components. These include the Arts, the Humanities, Science, and Technology. The most neglected of these is often the study of technology in that it is often given only cursory and peripheral treatment.

As a part of the curriculum, we see technology as the integrator of other bodies of knowledge such as science, psychology, sociology, and math. As an integrator, technology pulls together bits and pieces of these separate fields and directs them toward solution of problems. The practical knowledge concerning the solving of these problems comes directly from technological fields. Technology, then, can be viewed as the integrator and director of knowledge as applied to solving practical problems.

With that operating definition of technology in mind, an overview

of the high school program proposed and being developed by TIE Institute is shown below.



Students at the ninth grade level are helped to understand that any technological phenomenon can be broken down into six basic parts. These parts--materials, processes, machines, energy, information and man--can be identified, separated, and studied by the student. The student is then helped to put them back in proper relationship through many specific experiences.

Following this introduction to technology, the student may study within that areas of communications, construction, manufacturing, or service. Some students may elect to spend considerable time in one of these areas such as manufacturing and work as a member of a small

product producing company. Other students more interested in management, business, or systems may elect to enter the Enterprise facet of the program. Here they would take on the responsibility of managing and directing the manufacturing and construction companies, and the communication and service departments in which the other students are working.

At the twelfth grade level students may work in Research and Development to pursue some specific study in depth. Many of the studies such as those concerning new materials, processes or devices, can be related back to improving the Basic Technology course or to the improvement of the operation of the student companies. Students may also get involved with such topics as pollution, mass transportation, space environments, and others that can be related to the overall school program. In these instances technology is seen as an interdisciplinary study.

Job Staging at the twelfth grade level is designed to help students move from the school environment into the world of work. The major strategy used in this part of the program is to simulate some of the major aspects of the specific job that a student plans to take on graduation. In this manner the student is helped to get a grasp of the larger context within which the job fits as well as some of the possible points of friction and frustration that might arise for the student as a new worker on the job.

Organization

The organization of TIE Institute is important in that TIE plans to use the talents of two rather different communities--the educational and the technological. It is planned that TIE will serve as both an interface and a coordinating vehicle between these two communities.

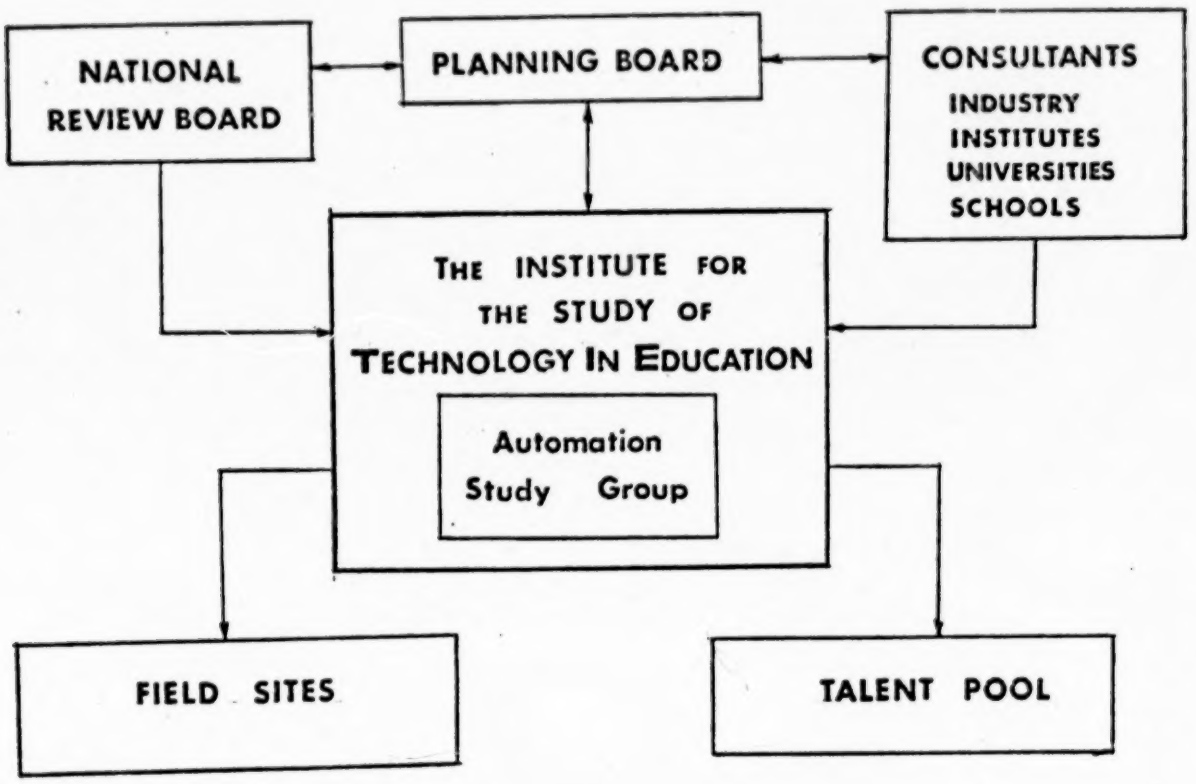
Educators and industrialists do talk somewhat different languages. Even those educators involved in industrial and technological type studies find it difficult to maintain bridges of communication with more than a few individuals from industry. Consequently it is planned that TIE will eventually consist of persons with educational and industrial experience and will assume the mission of facilitating two-way information flow as a necessary requirement of any cooperative venture.

The Automation Study Project fits within the general area of manufacturing. Automation is viewed as an important facet of mass production. It is assumed by the TIE staff that to study mass production or manufacturing without looking at automation and its parts--process, handling and control--is to leave the task unfinished.

The TIE staff has had considerable experience in helping teachers set up mass production activities for students. The staff has also worked with a number of teachers in introducing automation into their schools. The specific concern at this point is to provide support materials (1) to aid teachers and students in their study of processes, handling and control and (2) to combine these elements in order to stage specific instances of automation. Initially these instances

would be extremely simple in nature and then progressively through the aid of the instructional packages become more and more complicated and involved. In most if not all cases the study of automation would grow out of specific hands-on experiences provided in the shops and laboratories.

The diagram below sketches in graphic form the relationship of TIE Institute with some of the major cooperating groups and agencies.



Of the five cooperating agencies included in the diagram above, four would be populated with persons from industry. These include the following:

The National Review would serve as a sounding board for plans, ideas and directions and would include national figures in industry and technology.

The Planning Board would serve as a steering committee for the Institute. This group would also help search for continuing support for the different cooperative efforts.

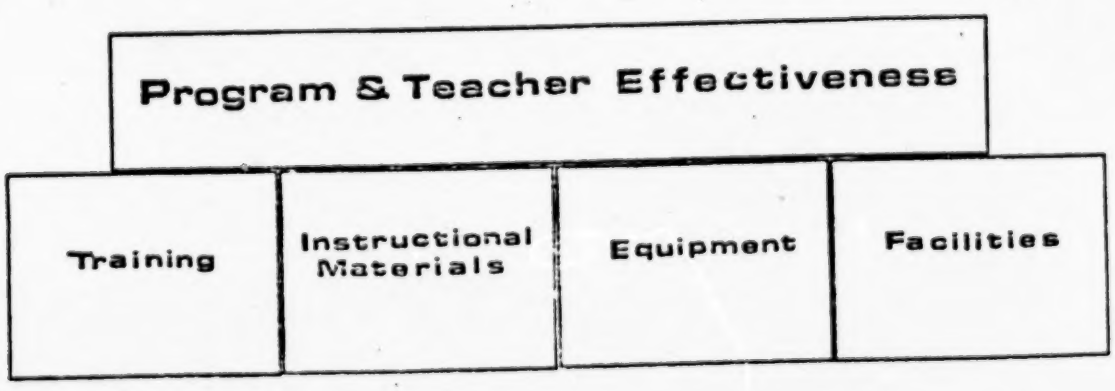
The Consultant Network would provide the Institute with needed technical support for the establishment and implementation of projects such as the Automation Study Project.

The Talent Pool which would be drawn largely from the local area represents a potential resource of skills and knowledge. Industrialists, some who may be retired, could find the Institute a creative outlet for their talents.

It is hoped that the MHI will help identify individuals who might be interested in participating in one of these groups.

Missions

TIE Institute has five general missions. These are (1) development (2) demonstration (3) dissemination (4) training and (5) research. Although none of these can operate effectively without the others, our focus in this discussion will be on the development mission. Within this mission the TIE staff will be concerned with generating several sub-systems to support teacher and program effectiveness in the schools. These are shown graphically below:



We will discuss two of these support systems that are directly related to the Automation Study Project--namely, the system dealing with equipment and the system dealing with instructional materials. The equipment system is being developed by the TIE staff in another cooperative effort. It perhaps can best be described as a sophisticated Erector Set. Just as the parts of an Erector Set can be put together to construct many different toys, the parts of the equipment system can be combined to construct a variety of simple machines, structures, and devices.

The components of the equipment system can also be used with the standard machines found in school shops and labs. By adding a pneumatic feeding device, micro-switches, and other components to a standard drill press, for instance, it can be made to operate automatically. It is this potential of the equipment system that supports the proposed Automation Study Project. The equipment system provides the important hands-on experiences for students.

Actual objects developed by students and teachers by using the equipment system are many and varied. Some of these include: roller conveyors, belt conveyors, storage units, cabinetry, furniture, work benches, presses, jigs, fixtures, plastic forming machines and drilling machines.

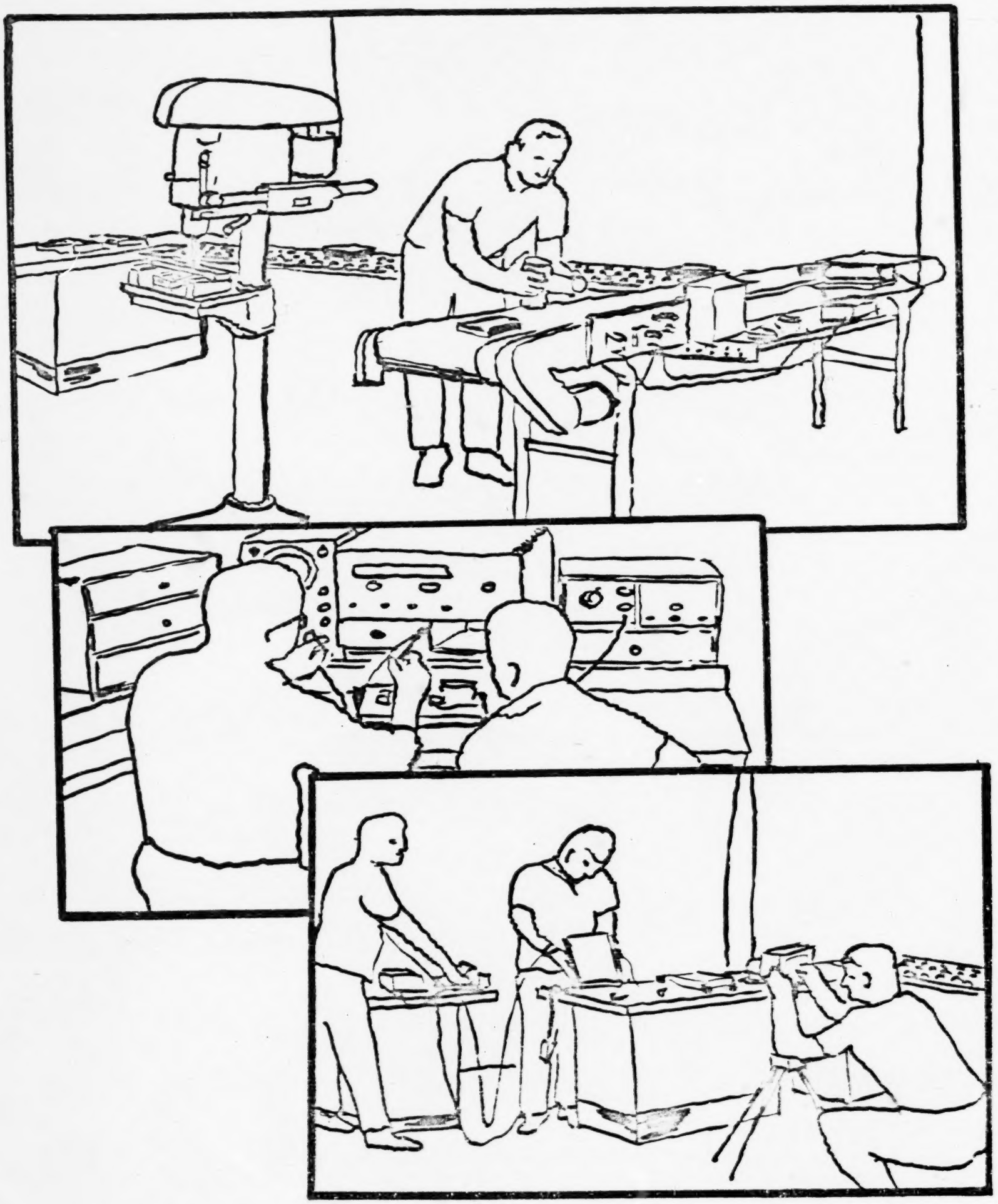
The second support system to be considered deals with instructional materials. Instructional materials that are designed specifically to aid students in developing concepts and insights from the

specific level to the abstract are for the most part not available. Such materials, although difficult and expensive to develop, can be produced.

Some of the initial work carried out by the TIE staff indicates that materials can be developed that involve junior high children in rather weighty areas of study. Those materials usually take the form of self-instructional packages that can be used by the teacher or student with little outside assistance. In this way the teacher as well as the student may learn much of the material on their own in a relatively safe setting.

The self-instructional package has another capability of some importance. Specific packages can be developed by utilizing and translating existing materials from industry into appropriate form for students. A specific package on "Fork Trucks" might be developed using much of the materials generated by CICMHE as the basic ingredients. Additional packages could then be developed to connect such a specific package to other packages, especially those with related concepts, ideas and skills.

Many different packages are currently needed to support the study of students involved in mass production type activities similar to the TIE program. The photographs below indicate the type of activities that would be supported by self-instructional packages.



The specific packages that would support the above activities would include topics such as:

conveyor operation

conveyor design

loading

unloading

fixture design

machine erection

sensing

controls

logic

inspection

evaluation

assembly

work-study

quality control

All of these topics can be tied together and made important for the student to know through attempting to mass produce even a simple product. This is especially true when part of the production line or even one machine on the line is made automatic.

Procedures

An important facet of the Automation Study Project and the operation of TIE deals with the procedures that guide the cooperative work of the technologists and educators. These procedures spell out who is

to do what in the cooperative effort and what major concepts and ideas are considered important. In this way specific industrialists and teachers can identify where they fit into and can contribute to the overall effort.

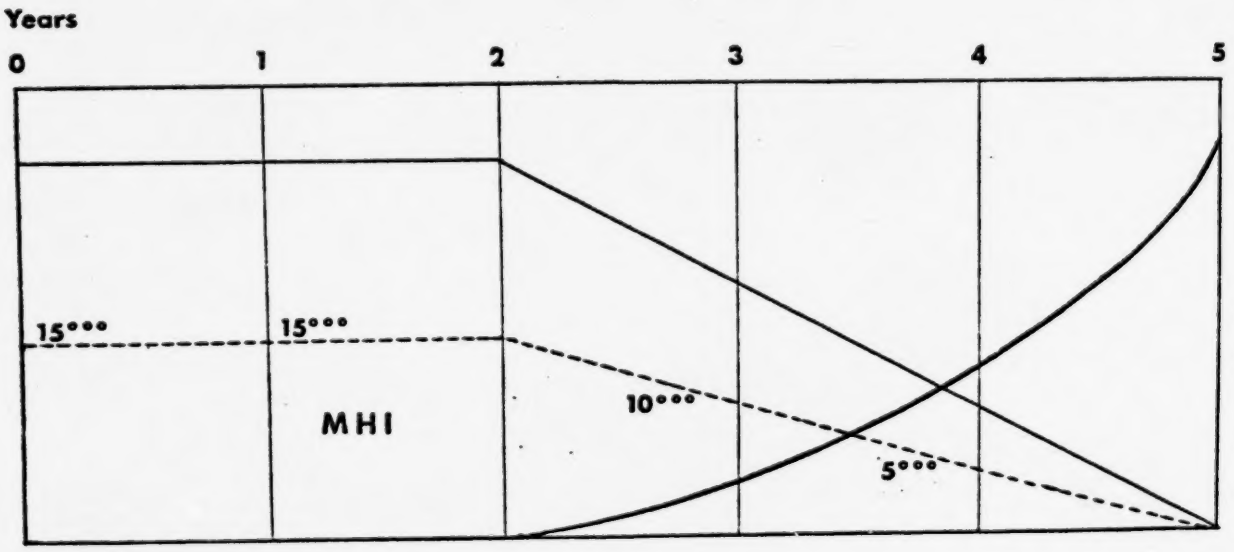
The guiding procedural documents that are being developed by the TIE staff are important if the available resources and talent from industry are to be directed effectively toward improving technology oriented programs in public schools. With a minimum of training in the use of the procedures, individuals who are separated geographically could still work together on specific aspects of projects such as the Automation Study Project. In this way the cooperating network that would radiate out from TIE could be increased significantly.

Perhaps even more importantly the development of viable procedural documents and designs would support setting up additional agencies similar to TIE. The cooperative approach with its supportive procedural documents could serve as a model for similar undertakings. If the work of TIE Institute appears to be worth sharing and expanding, the procedural tools developed by the staff will take on added significance. Here then may reside the real potential of TIE Institute and the proposed cooperative approach

In order to implement the Automation Study Project, financial support is required. The chart below indicates the funding pattern and strategy for the project. The total cost amounts to $90,000, half of which is being requested from the MHI. The specific cost to the MHI

would be $15,000 a year for a three year period or a total of $45,000. Other groups and individual companies have indicated their interest in providing part of the financial support for the project. It would appear that funding from these industrial groups will be forthcoming as the general economy improves.

FUNDING PLAN - AUTOMATION PROJECT



TOTAL FUNDS	90°°°
MHI	45°°°
Others	45°°°

It is anticipated that the royalty returns on the materials produced in the project would start sometime during the third year. The decreasing financial support from the MHI and other contributing agencies would be picked up by these returns. Ideally the royalties

would allow the Automation Study Project to continue to operate or even to expand. Hopefully other missions such as dissemination of the materials and the training of teachers to use the materials could also be underwritten by the monies from the royalty returns.

In closing let me thank you and the members of the Material Handling Institute. Your interest and help is appreciated and encouraging. We at TIE get quite excited about the potential of the cooperative approach with individuals and organizations from the technological community. We hope that the Automation Study Project as such a cooperative effort may soon become a reality.